



深圳市拓普微科技开发有限公司

SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

LM6063HFW

LCD Module User Manual

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Rev.	Descriptions	Release Date
0.1	Preliminary release	2009-10-29
0.2	Add Terminal Definition and Interface setting	2010-6-4

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1. Basic Specifications

1.1 Display Specifications

- | | |
|---------------------|--|
| 1) LCD Display Mode | : STN, Negative, Transmissive |
| 2) Display Color | : Display Data = "0" : Dark Blue(*1) |
| | : Display Data = "1" : Light Gray (*2) |
| 3) Viewing Angle | : 6H |
| 4) Driving Method | : 1/65 duty, 1/9 bias |
| 5) Backlight | : White LED backlight |

Note:

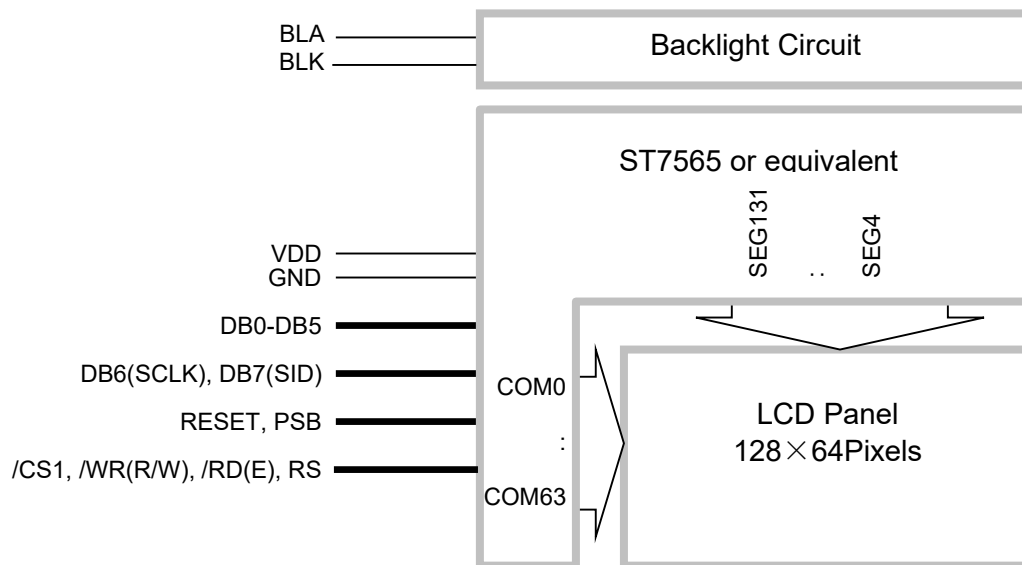
*1. Color tone may slightly change by Temperature and Driving Condition.

*2. The Color is defined as the inactive / background color

1.2 Mechanical Specifications

- | | |
|----------------------|--|
| 1) Outline Dimension | : 93.0 x 70.0 x 10.1MAX (mm) |
| | (See attached Outline Drawing for details) |

1.3 Block Diagram



1.4 Terminal Functions

K3 Pin No.	K1 Pin No.	PIN Name	I/O	Descriptions(PSB=H)		Descriptions(PSB=L)
				8080 mode	6800 mode	SPI mode
1	1	VSS	Power	Negative power supply,0V		
10	2	VDD	Power	Positive power supply		
3	3	NC	/	/		
6	4	RS	Input	Register Select RS = H, Transferring the Display Data RS = L, Transferring the Control Data		
/	5	/WR(R/W)	Input	/WR=L→H, /RD=H; Data or Instruction latch into the LCD module	R/W=H,E=H; Data or Status read from the LCD module R/W=L,E=H→L; Data or Status latch into the LCD module	Not used, connect to VDD
/	6	/RD(E)	Input	/WR=H, /RD=L; Data or Status read form the LCD module		
/	7	DB0	I/O	8-bit Data bus; Three state I/O terminal for display data or instruction data when /CS=H, DB0~DB7=High Impedance		DB5-DB0 connect to VDD
/	:	:	:			
/	12	DB5	I/O			
2	13	DB6(SCL)	I/O			Serial clock input
5	14	DB7(SI)	I/O			Serial data input
/	15	PSB	Input	Parallel or SPI setting PSB=H, Parallel(8080 or 6800) mode PSB=L, SPI mode(Default)		
7	16	/CS	Input	Chip Select /CS=L, enable access to the LCD module /CS=H, disable access to the LCD module		
8	17	/RESET	Input	Reset signal /RESET = L, Initialization is executed /RESET = H, Normal running.		
9	18	NC	/	/		
4	19	BLA	Power	Positive power for LED backlight		
/	20	BLK	Power	Negative power for LED backlight		

Interface setting:

Setting	8080 mode	6800 mode	SPI mode(Default)*
JP1	OPEN	CLOSE	OPEN
JP2	CLOSE	CLOSE	OPEN
JP4	CLOSE	OPEN	CLOSE
JP5	OPEN	OPEN	CLOSE

*Note: SPI Interface Setting on K1 Terminal: PSB=L, use SPI Interface.

2. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Supply Voltage	V_{DD}	-0.3	+3.4	V	$V_{SS} = 0V$
Input Voltage	V_{IN}	-0.3	$V_{DD}+0.3$	V	$V_{SS} = 0V$
Operating Temperature	T_{OP}	-20	+70	°C	No Condensation
Storage Temperature	T_{ST}	-30	+80	°C	No Condensation

Cautions:

Any Stresses exceeding the Absolute Maximum Ratings may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

3. Electrical Characteristics

3.1 DC Characteristics

$V_{SS}=0V$, $V_{DD}=3.3V$, $T_{OP}=25^{\circ}C$

Items	Symbol	MIN.	TYP.	MAX.	Unit	Condition / Application Pin
Operating Voltage	V_{DD}	2.9	3.3	3.4	V	VDD
Input High Voltage	V_{IH}	$0.8 \times V_{DD}$	-	V_{DD}	V	/RES, /CS1, A0, SI, SCL
Input Low Voltage	V_{IL}	V_{SS}	-	$0.2 \times V_{DD}$	V	
Operating Current	I_{DD}	-	0.36	1.8	mA	VDD

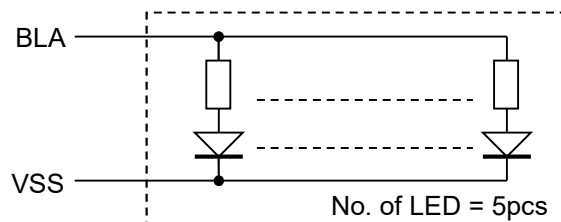
3.2 LED Backlight Circuit Characteristics

$V_{SS}=0V$, $I_{fBLA}=85mA$, $T_{OP}=25^{\circ}C$

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Forward Voltage	V_{fBLA}	-	3.3	-	V	BLA
Forward Current	I_{fBLA}	-	85	100	mA	BLA

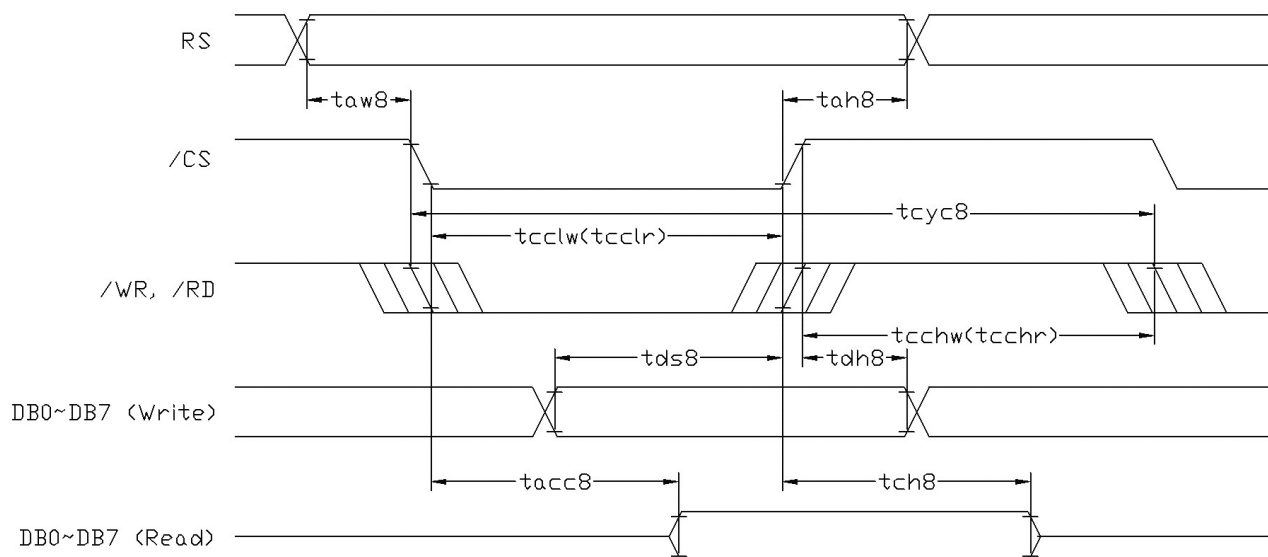
Cautions:

Exceeding the recommended driving current could cause substantial damage to the backlight and shorten its lifetime.



3.3 AC Characteristics

3.3.1 8080 Mode System Bus Timing



$V_{SS}=0V$, $V_{DD}=3.3V$, $T_{OP}=25^{\circ}C$

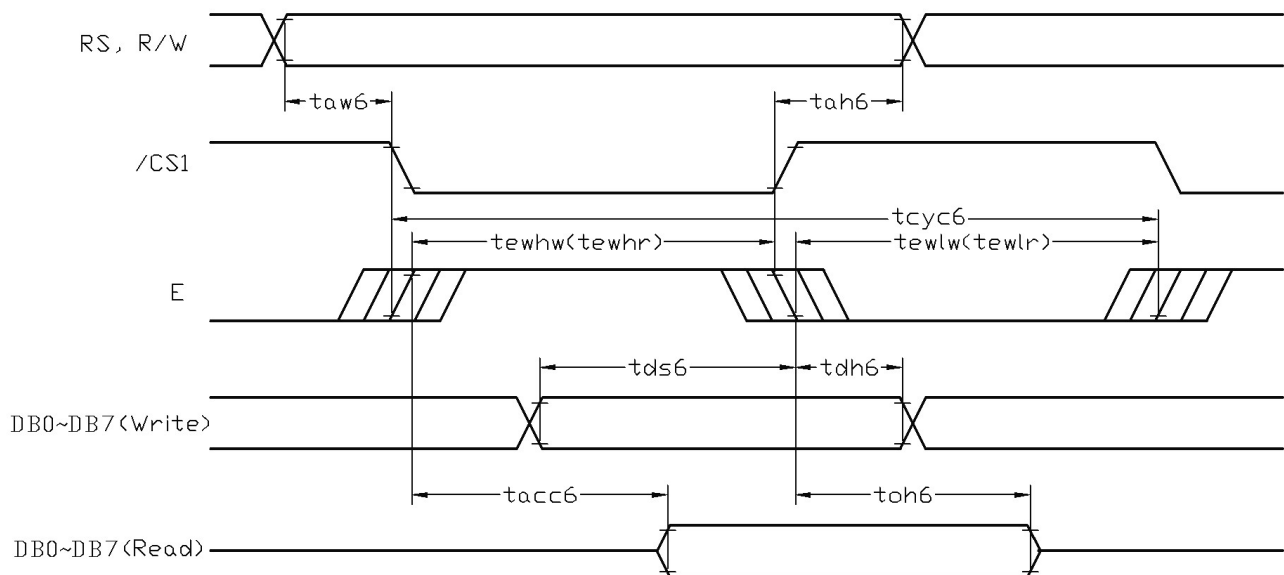
Item	Symbol	MIN.	TYP.	MAX.	Unit
System cycle time	tcyc8	342	-	-	ns
Address setup time (RS)	taw8	10	-	-	ns
Address hold time (RS)	tah8	10	-	-	ns
Control LOW pulse width (/WR)	tcclw	114	-	-	ns
Control LOW pulse width (/RD)	tcclr	200	-	-	ns
Control HIGH pulse width (/WR)	tcchw	114	-	-	ns
Control HIGH pulse width (/RD)	tcchr	114	-	-	ns
Data setup time	tds8	57	-	-	ns
Data hold time	tdh8	10	-	-	ns
/RD access time (*2)	tacc8	-	-	100	ns
Output disable time (*2)	tch8	7	-	71	ns

Note:

*1. Input signal rise/fall time should be less than 15ns

*2. CL=100pF

3.3.2 6800 Mode System Bus Timing



$V_{SS}=0V$, $V_{DD}=3.3V$, $T_{OP}=25^{\circ}C$

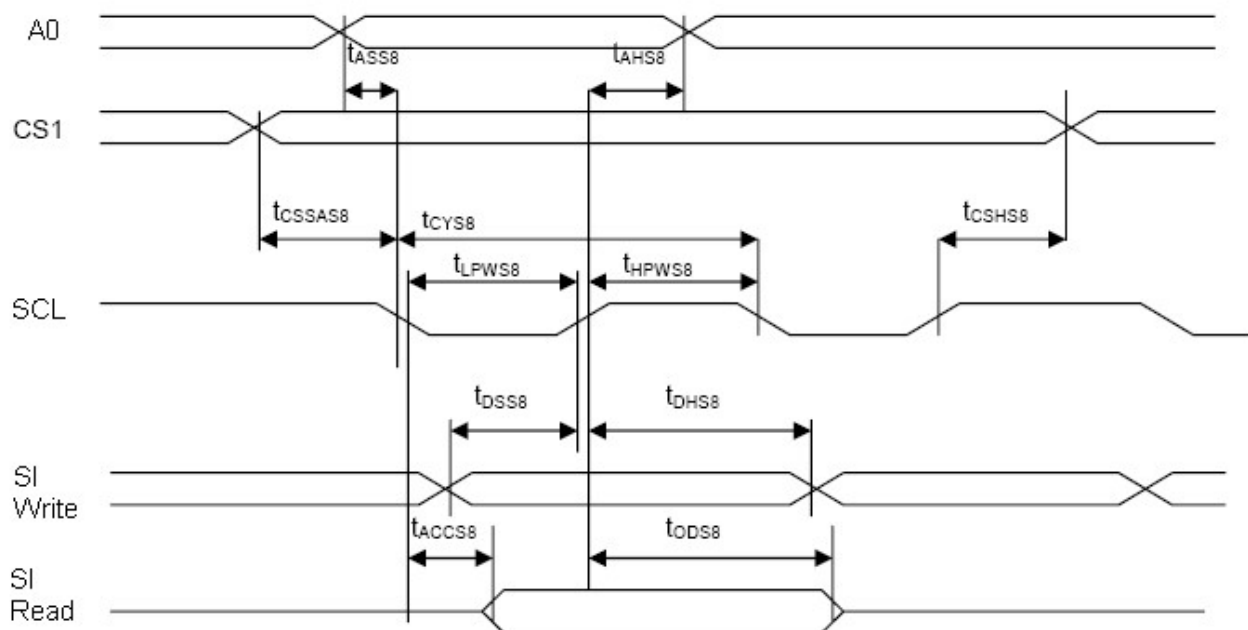
Item	Symbol	MIN.	TYP.	MAX.	Unit
System cycle time	t_{cyc6}	342	-	-	ns
Address setup time (RS)	t_{aw6}	10	-	-	ns
Address hold time (RS)	t_{ah6}	10	-	-	ns
Control LOW pulse width (E)	t_{ewlr}	114	-	-	ns
Control LOW pulse width (R/W)	t_{ewlw}	114	-	-	ns
Control HIGH pulse width (E)	t_{ewhr}	200	-	-	ns
Control HIGH pulse width (R/W)	t_{ewhw}	114	-	-	ns
Data setup time	t_{ds6}	57	-	-	ns
Data hold time	t_{dh6}	10	-	-	ns
/RD access time (*2)	t_{acc6}	-	-	100	ns
Output disable time (*2)	t_{oh6}	7	-	71	ns

Note:

*1. Input signal rise/fall time should be less than 15ns

*2. $CL=100pF$

3.3.3 SPI Mode System Bus Timing



$V_{SS}=0V, V_{DD}=3.0V, T_{OP}=25^{\circ}C$

Item	Symbol	MIN.	TYP.	MAX.	Unit
System cycle time	tcys8	36	-	-	ns
Address setup time (A0)	tass8	0	-	-	ns
Address hold time (A0)	tahs8	0	-	-	ns
Control LOW pulse width (SCL)	tlpws8	20	-	-	ns
Control HIGH pulse width (SCL)	thpws8	20	-	-	ns
Data setup time	tdss8	20	-	-	ns
Data hold time	tdhs8	0	-	-	ns
Read access time (*2)	taccs8	-	-	60	ns
Output disable time (*2)	tods8	15	-	-	ns

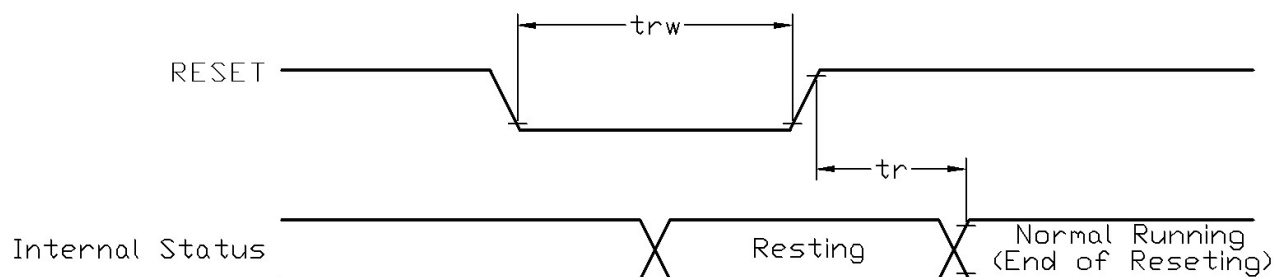
Note:

*1. Input signal rise/fall time should be less than 15ns .

*2. CL=100pF

*3.All timing is using 20% and 80% of VDD as the reference.

3.3.2 Reset Timing



$V_{SS}=0V, V_{DD}=3.0V, T_{OP}=25^{\circ}C$

Item	Symbol	MIN.	TYP.	MAX.	Unit
Reset time	tr	10	-	-	ms
Reset LOW pulse width	trw	3	-	-	μs

Note:

*1.All timing is using 20% and 80% of VDD as the reference.

4. Function specifications

4.1 Basic Setting

To drive the LCD module correctly and provide normally display, please use the following setting

- ADC = 1 (reverse)
- SHL select = 0 (normal)
- LCD Bias Select = 1/9
- Initial Display Line = 0
- Entire Display ON/OFF = OFF (normal)
- Reverse Display ON/OFF = OFF (normal)
- Set Power Control Set:
 - voltage follower = ON, voltage converter = ON, voltage regulator = ON
- Display ON/OFF = ON

Note:

*1. These setting/commands should issue the LCD module while start up.

*2. See the Display Commands section for details.

4.2 Resetting the LCD module

The LCD module should be initialized by using /RESET terminal.

While turning on the VDD and VSS power supply, maintain /RESET terminal at LOW level. After the power supply stabilized, release the reset terminal (RESET=HIGH)

4.3 Display Memory Map

Page address	data	LCD Display (front view)	
0	D0 : D7		
1	D0 : D7		
2	D0 : D7		
3	D0 : D7		
4	D0 : D7	128x64 pixels	
5	D0 : D7		
6	D0 : D7		
7	D0 : D7		
Column Address		00h	→ 7Fh

Note:

*1. ADC = 1 (reverse)

*2. SHL Selection = 0 (normal)

*3. Initial Display Line = 0

4.4 Display Commands

No.	Instructions	Code											Function
		a0	/RD	/WR	D7	D6	D5	D4	D3	D2	D1	D0	
1	Display ON/OFF	0	1	0	1	0	1	0	1	1	1	DON	DON=0, display off DON=1, display on
2	Display start line set	0	1	0	0	1	Display start address						Sets the display RAM display start line address
3	Set Page Address	0	1	0	1	0	1	1	Page Address				Set the display RAM page address
4	Set Column Address (Upper-4-bits)	0	1	0	0	0	0	1	Col. Add. Upper				Set the upper-4-bit of column address counter
	Set Column Address (Lower-4-bits)	0	1	0	0	0	0	0	Col. Add. Lower				Set the lower-4-bit of column address counter
5	Read Status	0	0	1	Status				0	0	0	0	Read the status data
6	Write Display Data	1	1	0	Write Data								Write data into the display RAM
7	Read Display Data	1	0	1	Read Data								Read data form the display RAM
8	ADC Select	0	1	0	1	0	1	0	0	0	0	ADC	Sets the display RAM address SEG output correspondence ADC= 0,normal . ADC=1, reverse
9	Normal/Reverse Display	0	1	0	1	0	1	0	0	1	1	REV	REV=0, Normal display REV=1, Reverse display
10	Entire Display ON/OFF	0	1	0	1	0	1	0	0	1	0	EON	EON=0, Normal display EON=1, Entire display ON
11	Set LCD Bias	0	1	0	1	0	1	0	0	0	1	BIAS	Set the LCD driving voltage bias BIAS=0, 1/9 BIAS BIAS=1, 1/7 BIAS
12	Set Read-Modify-Write	0	1	0	1	1	1	0	0	0	0	0	Enter the "Read-Modify-Write" mode column address counter will increase in each "Write Display Data", and will not increase in each "Read Display Data command"
13	Reset Read-Modify-Write	0	1	0	1	1	1	0	1	1	1	0	Clear the "Read-Modify-Write" mode
14	Reset	0	1	0	1	1	1	0	0	0	1	0	Resets the LCD module
15	SHL Select	0	1	0	1	1	0	0	SHL	*	*	*	Set the COM scanning direction SHL=0, Normal display SHL=1, Flipped in y direction * = don't care terms
16	Power Control Set	0	1	0	0	0	1	0	1	VC	VR	VF	Set the power circuit operation mode VF: LCD Supply Voltage Follower VR: LCD Supply Voltage Regulator VC: LCD Supply Voltage Converter (1=ON, 0=OFF)
17	Regulator Resistor Select	0	1	0	0	0	1	0	0	Radio setting			Set the built-in resistor ratio (Rb/Ra)

4.5 Display Commands (continue)

No.	Instructions	Code										Function	
		A0	/RD	/WR	D7	D6	D5	D4	D3	D2	D1		D0
18	Electronic volume mode set	0	1	0	1	0	0	0	0	0	0	1	Set reference voltage mode
	Electronic volume register set	0	1	0	*	*	Electronic Control value					Set reference voltage register (Display contrast value)	
19	Sleep Mode Set	0	1	0	1	0	1	0	1	1	0	S	Sleep Mode (2 byte command)
		0	1	0	0	0	0	0	0	0	0	0	S=0, sleep mode S=1, normal mode
20	Booster Ratio Set	0	1	0	1	1	1	1	1	0	0	0	Booster Ratio (2 byte command)
		0	1	0	0	0	0	0	0	0	Ratio	Ratio=00, 2x, 3x, 4x Ratio=01, 5x Ratio=11, 6x	
21	NOP	0	1	0	1	1	1	0	0	0	1	1	Non-operation command

Note: *1. Do not use any other command not listed, or the system malfunction may result.
*2. For the details of the Display Commands, please refer to ST7565R data sheet.

4.5.1 Power off the LCD Module

It recommends that enter Sleep Mode before power off the LCD module.

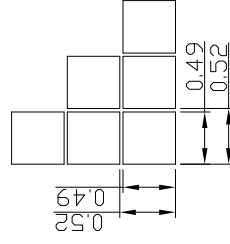
4.5.2 Refreshing The LCD Module

It recommends that the operating modes and display contents be refreshed periodically to prevent the effect of unexpected noise.

5. Design and Handling Precaution

Please refer to "LCD-Module-Design-Handling-Precaution.pdf".

K1	Terminal
No.	Pin Name
1	VSS
2	VDD
3	NC
4	RS
5	/WR(R/W)
6	/RD(E)
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6(SCL)
14	DB7(SI)
15	PSB
16	/CS
17	/RST
18	NC
19	BLA
20	BLK



*10. Default Interface : Serial (K1 or K3)



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